



# ITXG71

## 35.8cm(14.1 inch) XGA(1024x768)

### Color TFT LCD Module

ITXG71 is a color TFT LCD module to be designed for the display of a notebook-style personal computer. In addition to its large screen, the characteristics of this module are light weight, slim/thin outline, low power consumption and high resolution of XGA(1024x768) capability.

#### Features

- 35.8cm(14.1 inch) diagonal
- Native 262k colors (R/G/B 6bit each)
- XGA 1024 x 768 pixels
- Low Reflection (Black Matrix)
- 304mm x 230mm x 8.5mm typ.  
(without inverter)
- 655 g typ.(without Inverter)
- 4.1 W typ.(without inverter)
- Single LVDS interface  
( TI SN75LVDS86 or Compatible )
- Side mount type

#### Applications

- Notebook PCs
- Monitors

IBM Corporation

1997

Version 1.0 (1)

OEM Spec.

# 02 / 02

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**Characteristics Summary**

Screen Diagonal	35.8cm(14.1")
Active Area	285.7mm(H) x 214.3mm(V)
Pixel Format	1024(x3) x 768
Pixel Pitch	0.279(per one triad) x 0.279
Pixel Arrangement	R,G,B Vertical Stripe
Display Mode	Normally White
White Luminance	90 cd/m <sup>2</sup> Typ. (CFL Discharge Current = 3.8 mA <sub>max</sub> )
Contrast Ratio	100 : 1 Typ.
Optical Rise Time/Fall Time	30 msec. Typ., 50msec. Max.
Nominal Input Voltage VDD	+5.0V
Power Consumption (without inverter) (VDD line + Lamp input line)	4.1W Typ.
Weight	655 grams Typ. (w/o inverter)
Physical size	304mm x 230mm x 8.5mm typ. (w/o inverter)
Electrical Interface	R/G/B Data, 3 Sync signals, Clocks in 4 pairs LVDS and VDD, GND
Supported Colors	Native 262k colors
Temperature Range	
Operating	+0 to +50 degC
Storage	-20 to +60 degC

IBM Corporation

1997

Version 1.0 (2)

OEM Spec.

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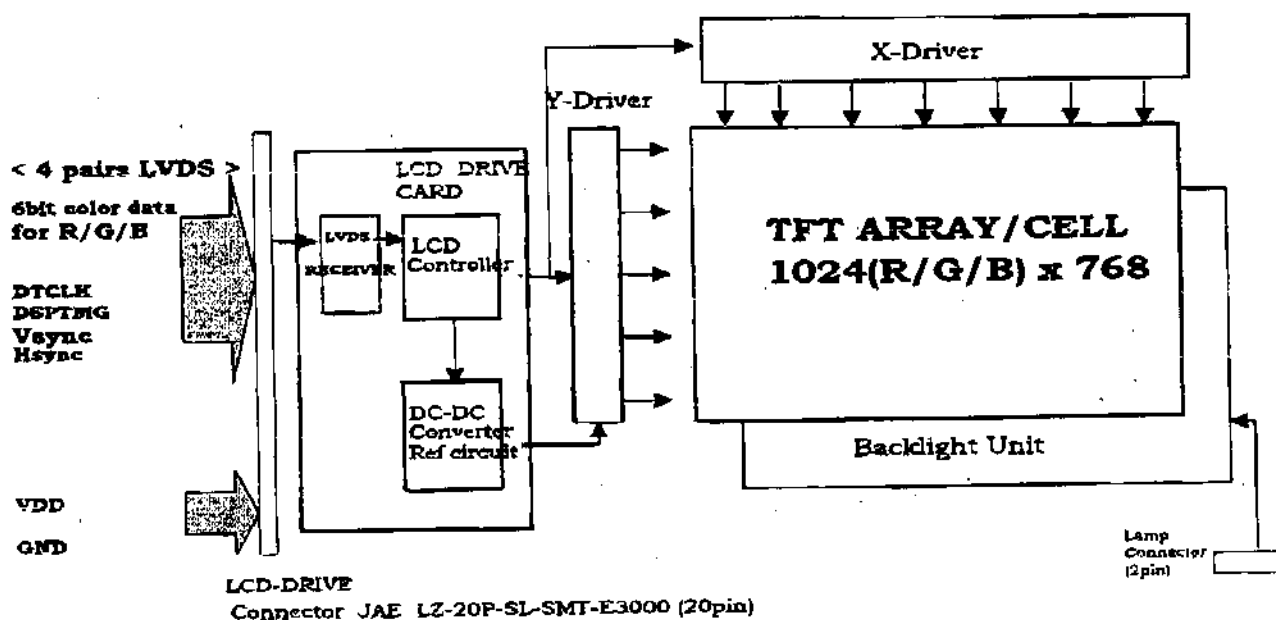
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## Absolute Maximum Ratings

Rating	Symbol	Value	Unit	Conditions
Supply Voltage	VDD	-0.3 to +6.0	V	
Lamp Current	I <sub>cl</sub>	7	mA/rms	
Storage Temperature	TST	-20 to +60	degC	At the glass surface
Operation Temperature	TOP	0 to +50	degC	At the glass surface
Operation Humidity		8 to 95	%RH	Max wet bulb temp. 39 degC No condensation

## Block Diagram



IBM Corporation

1997

Version 1.0 (3)

OEM Spec.

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**Signal Interface**

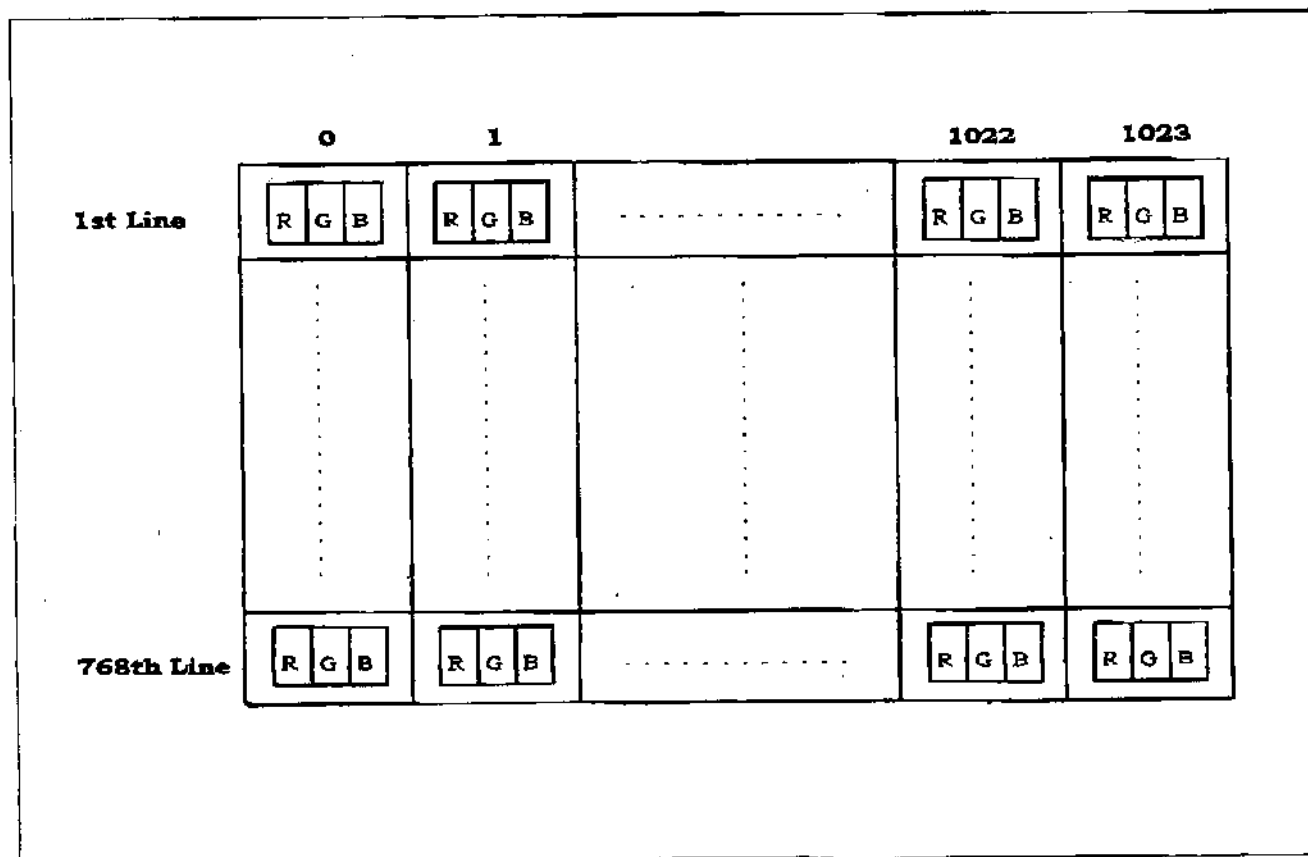
LCD Drive Connector		JAE	LZ-20P-SL-SMT-E3000
Corresponding Connector		JAE	LZ-20S-SC3
Corresponding Contact		JAE	LZ-SC-C3-A1-15000
Pin No.	Signal Name	Description	
1		No Connection	
2		No Connection	
3		No Connection	
4		No Connection	
5		No Connection	
6		No Connection	
7		No Connection	
8	-	No Connection	
9	RCLKIN+	Positive LVDS differential clock input	
10	RCLKIN-	Negative LVDS differential clock input	
11	RIN2+	Positive LVDS differential data input ( B2 - B5, HSYNC, VSYNC, DSPTMG)	
12	RIN2-	Negative LVDS differential data input ( B2 - B5, HSYNC, VSYNC, DSPTMG)	
13	RIN1+	Positive LVDS differential data input ( G1 - G5, B0 - B1)	
14	RIN1-	Negative LVDS differential data input ( G1 - G5, B0 - B1)	
15	RINO+	Positive LVDS differential data input ( R0 - R5, G0)	
16	RINO-	Negative LVDS differential data input ( R0 - R5, G0)	
17	GND		
18	GND		
19	VDD	+5.0V Power Supply	
20	VDD	+5.0V Power Supply	

**Note:** Above connection is applied for LVDS Single Channel interface.



## Pixel format image

Following figure shows the relationship of the input signals and LCD pixel format image.



### Signal Description

Signal Name	Description
+RED5	Red Data 5 (MSB)
+RED4	Red Data 4
+RED3	Red Data 3
+RED2	Red Data 2
+RED1	Red Data 1
+RED0	Red Data 0 (LSB)
Red-Pixel-Data	Each red pixel's data consists of these 6 bits pixel data
+GREEN5	Green Data 5 (MSB)
+GREEN4	Green Data 4
+GREEN3	Green Data 3
+GREEN2	Green Data 2
+GREEN1	Green Data 1
+GREEN0	Green Data 0 (LSB)
Green-Pixel-Data	Each green pixel's data consists of these 6 bits pixel data
+BLUE5	Blue Data 5 (MSB)
+BLUE4	Blue Data 4
+BLUE3	Blue Data 3
+BLUE2	Blue Data 2
+BLUE1	Blue Data 1
+BLUE0	Blue Data 0 (LSB)
	Each blue pixel's data consists of these 6 bits pixel data
-DTCLK	Data Clock The typical frequency is 65MHz. The signal is used to strobe the pixel data and +DSPTMG signals. All pixel data shall be valid at the falling edge when the +DSPTMG signal is high.
+DSPTMG	Display Timing This signal is strobed at the falling edge of -DTCLK. When the signal is high, the pixel data shall be valid to be displayed.
VSYNC	Vertical Sync The signal is synchronized to -DTCLK. Sync Polarity : Negative
HSYNC	Horizontal Sync The signal is synchronized to -DTCLK. Sync Polarity : Negative

**Note:** Output signals from system shall be low or Hi-Z state when VDD is off.

### Signal Interface for Lamp

Lamp Connector		JST	BHSR-02VS-1
Mating Connector		JST	SM02B-BHSS-1-TE
Pin No.	Signal Name	Description	
1	Lamp High		
2	Lamp Low	( GND )	

### Signal Specification

Differential Input Voltage for LVDS Receiver Threshold *1				
Parameter	Condition	Min.	Max.	Unit
V <sub>IH</sub>	Differential Input High Threshold (V <sub>CM</sub> = +1.2V)		+100	mV
V <sub>IL</sub>	Differential Input Low Threshold (V <sub>CM</sub> = +1.2V)	-100		mV

Note \*1 It is recommended to refer the specifications of SN75LVDS86 (Texas Instruments).

### Lamp Interface Specification

#### Absolute Maximum Rating

Parameter Name	Symbol	Value	Unit	Note
CFL Discharge Current	I <sub>CD</sub>	7.5 Max	[mA <sub>RMS</sub> ]	Exclude inrush current
CFL Inrush Current	I <sub>REF</sub>	30 Max	[mA <sub>0-1</sub> ]	T = 50 Max. [mSec]

### Lamp Characteristics

Parameter Name	Symbol	Min.	Typ.	Max.	Unit	Note
CFL Kick-off Voltage	V <sub>s</sub>	-	-	1,100	[V <sub>RMS</sub> ]	T <sub>amb</sub> = 25 degC <sup>-1</sup>
		-	-	1,500		T <sub>amb</sub> = 0 degC <sup>-1</sup>

\*1 Generally, CFL has some amount of delay time after applying kick-off voltage. It is recommended to keep on applying kick-off voltage for 1 [Sec] until dischargement.



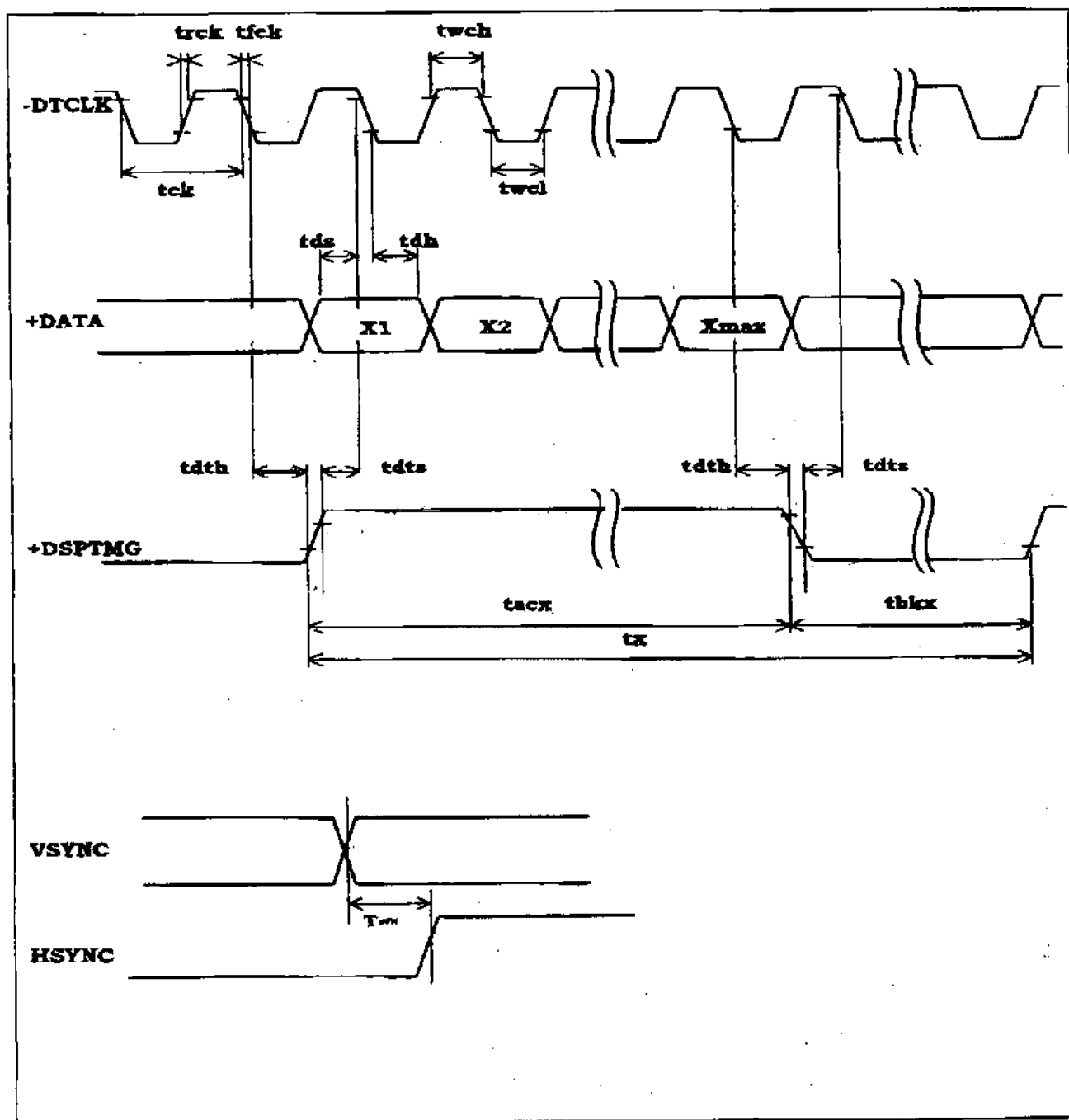
Parameter Name	Symbol	Min.	Typ.	Max.	Unit	Note
CFL Discharge Current	$I_{CFL}$	- <sup>5</sup>	-	7.0	[mA <sub>RMS</sub> ]	Total operating range
		-	3.8	-		Screen 90 [cd/m <sup>2</sup> ], 25degC
CFL Discharge Voltage	$V_{CFL}$	-	640	-	[V <sub>RMS</sub> ]	Screen 90 [cd/m <sup>2</sup> ], T <sub>amb</sub> =25 degC
CFL Power Consumption	$P_{CFL}$	-	2.4	-	[W]	Screen 90 [cd/m <sup>2</sup> ], T <sub>amb</sub> =25 degC
CFL Discharge Frequency	$F_{CFL}$	30	40	70 <sup>5</sup>	[KHz]	Reference <sup>5,6</sup>

## Interface Timings

Basically, interface timings should match the VESA 1024 x 768 Hz manufacturing guide line timing.

Symbol	Signal Description	MIN	TYP	MAX	UNIT
$f_{clk}$	DTCLK Frequency		65.00	65.34	MHz
$t_{ck}$	DTCLK cycle time		15.38		nsec
$t_{wd}$	DTCLK low width	5			nsec
$t_{wh}$	DTCLK high width	6			nsec
$t_{ds}$	Data set up time	4			nsec
$t_{dh}$	Data hold time	4			nsec
$t_{dts}$	DSPTMG set up time	4			nsec
$t_{dth}$	DSPTMG hold time	4			nsec
$t_x$	X total time	1206	1344	(2047)	clk
$t_{ax}$	X active time	129	1024		clk
$t_{bx}$	X blank time	90	320		clk
$H_{fp}$	H-sync front porch	0	24		clk
$H_{bp}$	H-sync back porch	1	160		clk
$H_{sync}$	H-frequency		48.36		KHz
$H_w$	H-sync width	4	68	$t_x/2$	clk
$t_y$	Y total time	771	806	1023	clk
$t_{ay}$	Y active time	1	768		clk
$t_{by}$	Y blank time	1	38		clk
$V_{sync}$	Frame rate		60.00	61.00	Hz
$V_w$	V-sync width	1	6	$t_y/2$	clk
$V_{fp}$	V-sync front porch	0	3		clk
$V_{bp}$	V-sync back porch	1	29		clk
$T_{pwh}$	Vsync - Hsync Phase difference	1			clk

Note:  $t_x$  (X total time) should be the same total time during 1 frame.

**Interface Timings Defenition**

IBM Corporation

1997

Version 1.0 (11)

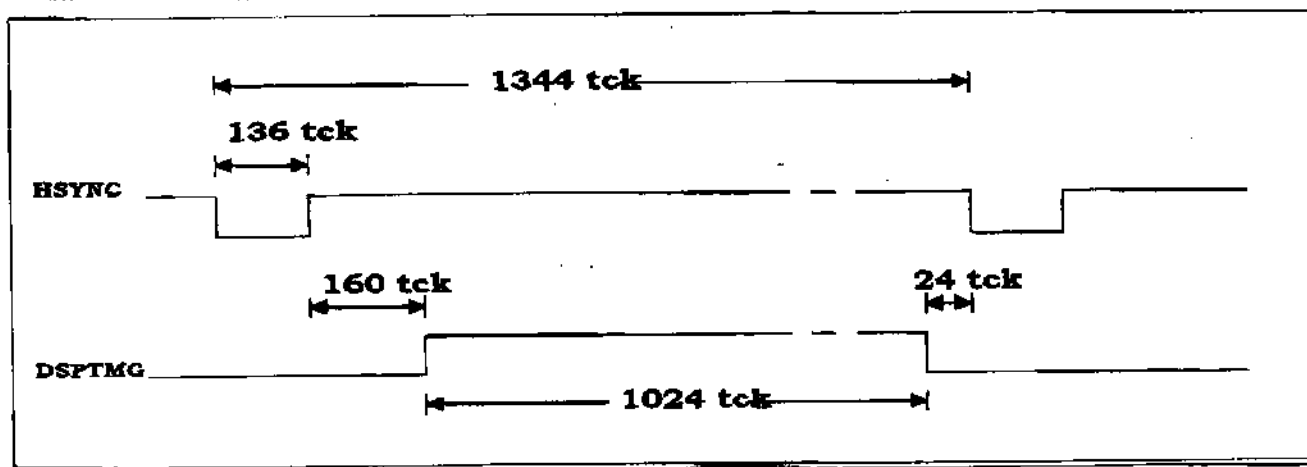
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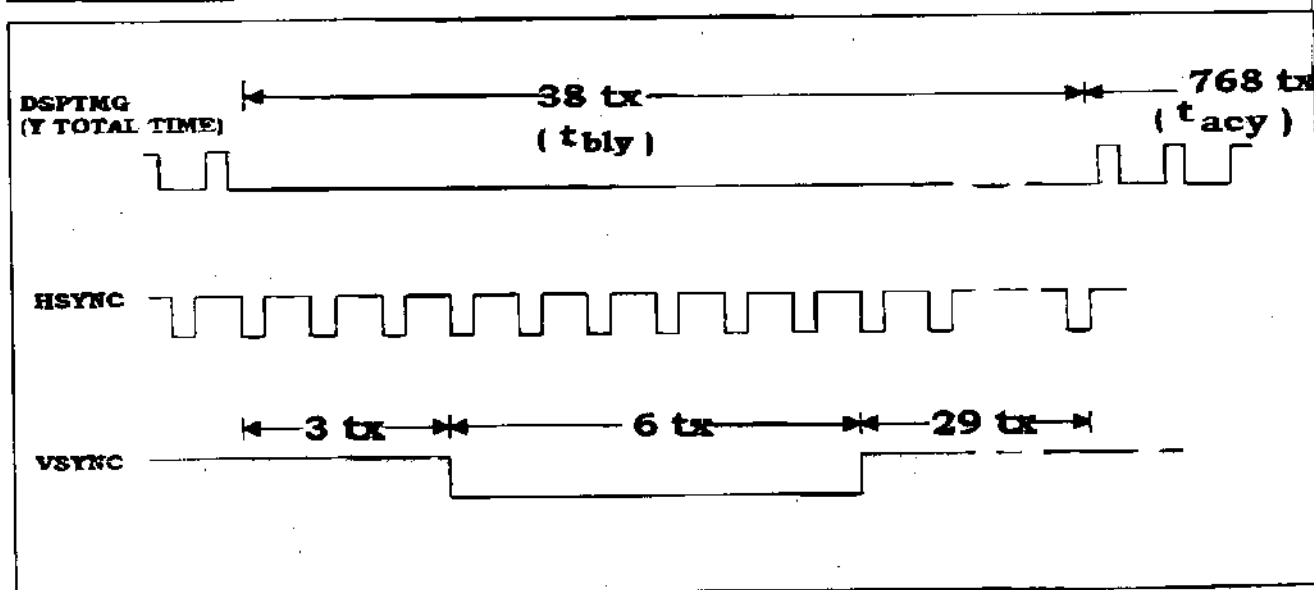
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### Horizontal Timing



### Vertical Timing

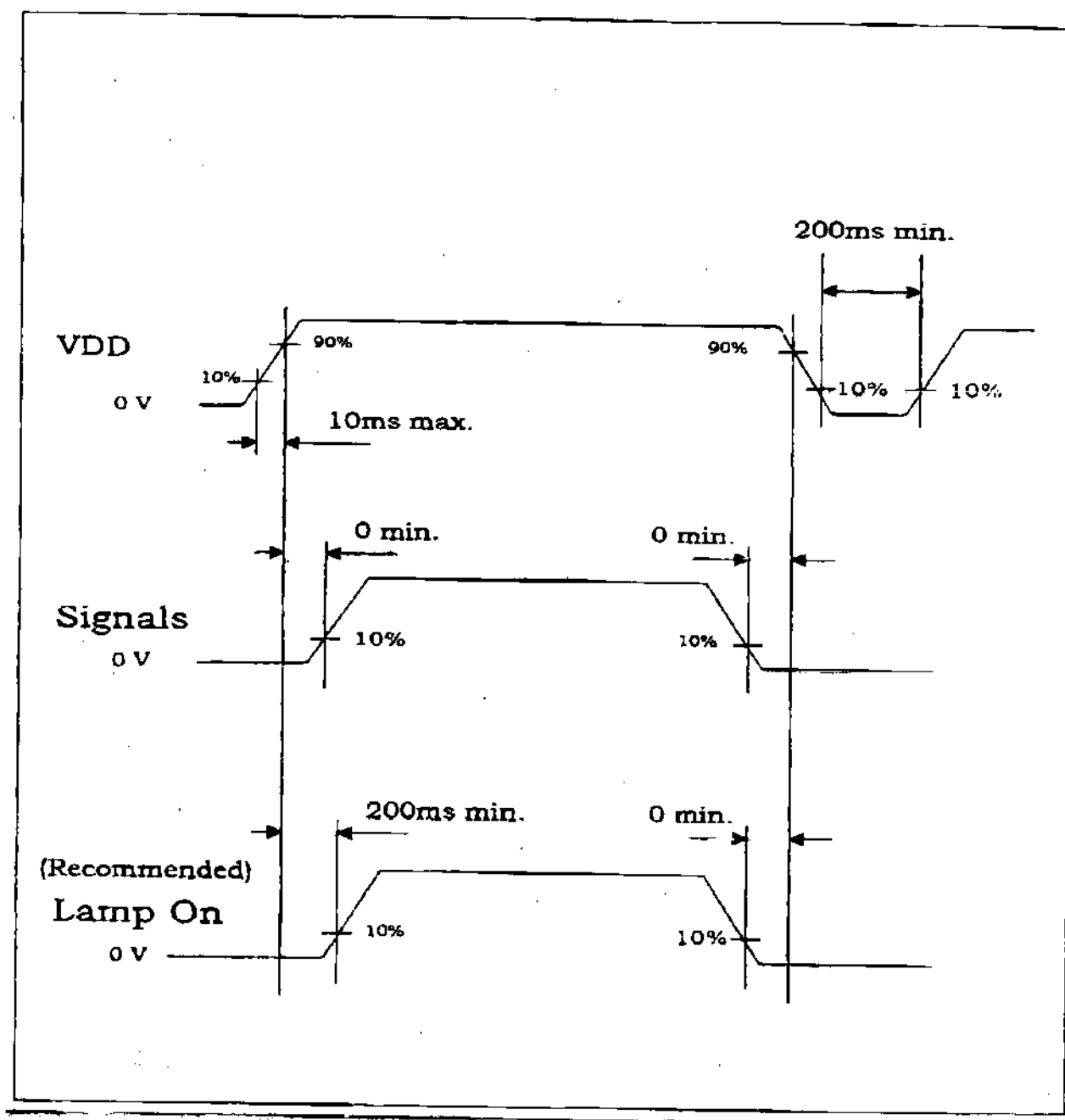


**Power Requirement**

SYMBOL	PARAMETER	Min.	Typ.	Max.	Unit	CONDITION
VDD	Logic/LCD Drive Voltage	+4.75	+5.0	+5.25	V	Load Capacitance 20uF
PDD	VDD Power		1.7		W	VDD= +5.0V All black pattern
				TBD		VDD= +5.0V Sub-pixel vertical stripe
PL	Lamp Power(w/o inverter)		2.4		W	90 nit (25 degC)
PDD+PL	Total Power(w/o inverter)		4.1		W	
VDDrp	Allowable Logic/LCD Drive Ripple Voltage			100	mVp-p	
VDDns	Allowable Logic/LCD Drive Ripple Noise			100	mVp-p	

**Note 1:** This requirements shall be met with 'All black pattern' unless otherwise specified.

**Note 2:** The Sub-pixel vertical stripe is the vertical stripe pattern where sub-pixels are On and Off at every other vertical line.

**Power ON/OFF sequence**

## Handling Precautions

- 1) Since front polarizer is easily damaged, pay attention not to scratch it.
- 2) Be sure to turn off power supply when inserting or disconnecting from input connector.
- 3) Wipe off water drop immediately. Long contact with water may cause discoloration or spots.
- 4) When the panel surface is soiled, wipe it with absorbent cotton or other soft cloth.
- 5) Since the panel is made of glass, it may break or creak if dropped or bumped on hard surface.
- 6) Since CMOS LSI is used in this module, take care of static electricity and insure human earth when handling.
- 7) Do not open nor modify the Module Assembly.
- 8) Do not press the reflector sheet at the back of the module to any directions.
- 9) In case if a Module has to be put back into the packing container slot after once it was taken out from the container, do not press the center of the CFL Reflector edge. Instead, press at the far ends of the CFL Reflector edge softly. Otherwise the TFT Module may be damaged.
- 10) At the insertion or removal of the Signal Interface Connector, be sure not to rotate nor tilt the Interface Connector of the TFT Module.
- 11) At and after installation of the TFT Module into an enclosure (Notebook PC Bezel, for example), do not twist nor bent the TFT Module even momentary. At designing the enclosure, it should be taken into consideration that no bending/twisting forces are applied to the TFT Module from outside. Otherwise the TFT Module may be damaged.



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Reference Drawing      For details refer Drawing P/N 09J0932

Note : Patens are under application for the design and the mounting mechanism of this panel.

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Version 1.0 (17)

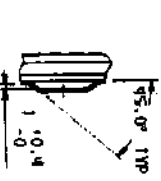
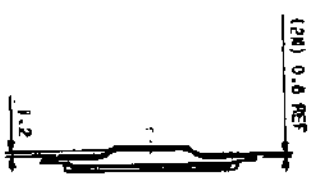
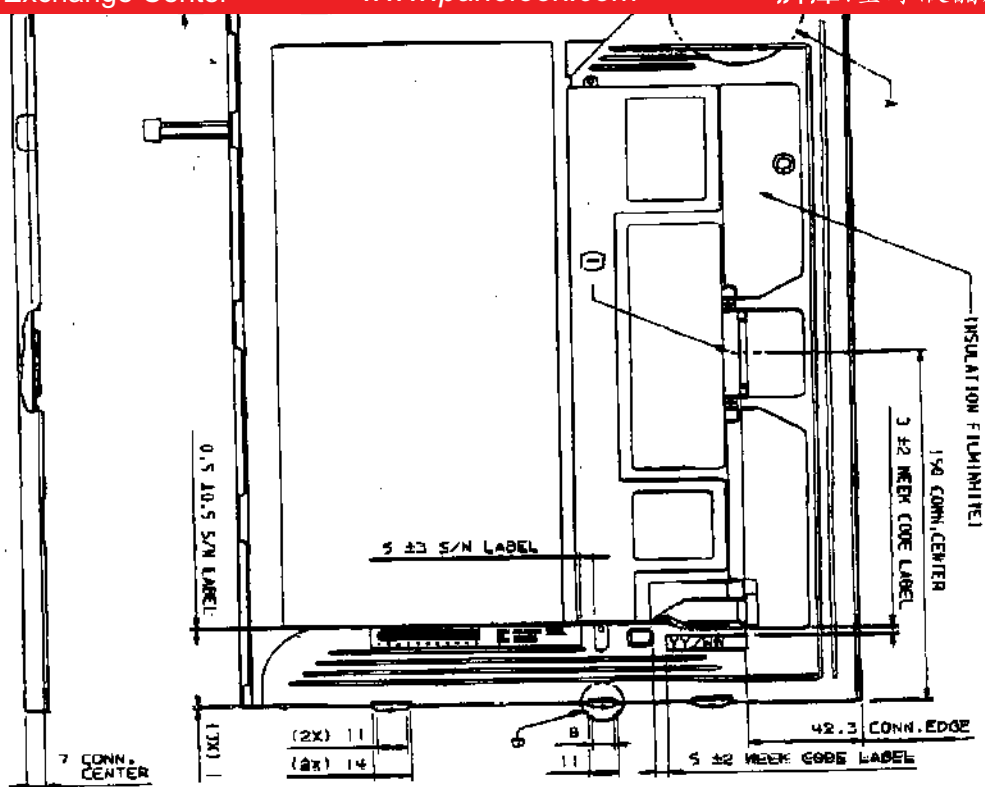
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REVISION NO.		Q/M	
USE CODE			
REL. FOR ASM	QTY	REWORK & APPROVAL	DATE
ELECTRICAL		06/04/96	96.11.06
MATERIAL		15/04/96	96.11.13
ET		20/06/96	96.12.20
DAY		07/04/97	96.08.05

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IBM MATERIAL NO.		MUST CONFORM TO ENR SPEC. OR IBM SPEC.	
MATERIAL ALLOCATE NO.		TOLERANCES UNLESS NOTED	
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CASE DEPTH		ANGLES 1	
FINISHES		RADIUS UNLESS NOTED	
SURFACE TREATMENT		EDGE/ACCOMMODATIONS/IDE MAX BREAKS	
		INSIDE MAX	
IBM MATERIAL NO.		SCALE: 1/1	
PART NO.		ITXG71	
TITLE REFERENCE DWS		IBM	
DESIGNED		T. J.	
CHECKED		Y. K.	
APPROVED		S. A.	
CLASS		S. A.	